

SECTION 02222 EXCAVATION FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, and disposing of, in the specified manner, all wet and dry materials encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work, the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of satisfactory pipe beds; the backfilling and tamping of trenches, foundations, and other structures; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the Construction Manager (CM), their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions apply to this Section.
- B. ORNL Stormwater and Pollution Prevention Plan.

1.3 SUBMITTALS

- A. Submit shop drawings for all products specified in this section in accordance with the requirements of General and Supplemental Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION OF THE SITE

- A. Before starting construction, remove from the work site all vegetable growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the Drawings and/or the CM specifically indicate are to be removed. Dispose of this refuse material in a manner acceptable to the CM.
- B. In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be shown on the Drawings, specifically listed in the specifications, marked on the site, or identified by the CM. In no case damage or remove such growth without written permission from the CM.
- C. If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth and grub the excavated area, and remove all large roots to a depth of not less than two feet below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the CM. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.

- D. Preparation of the site shall be considered an integral part of the excavation and one for which no separate payment shall be allowed.

3.2 UNSUITABLE MATERIALS

- A. Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below or as directed by the CM. Then refill the areas excavated for this reason with one to two inches of crushed stone up to the level of the lines, grades, and/or cross sections shown on the Drawings. The top six inches of this refill shall be No. 67 (TDOT) crushed stone for bedding.

3.3 ROCKS AND BOULDERS

- A. Should rock be encountered in the excavation, remove it by blasting or otherwise. Such removal will be coordinated and approved by the CM. Where blasts are made, cover the excavation with enough excavation material and/or timber or steel matting to prevent danger to life and property. The Subcontractor shall secure, at his own expense, all permits required by law for blasting operations and the additional hazard insurance required. Observe all applicable laws and ordinances pertaining to blasting operations.
- B. Excavate rock over the horizontal limits of excavation and to a depth of not less than six inches below the outside bottom of pipe up to 30 inches in diameter and not less than 12 inches below the outside bottom of larger pipes if rock extends to such depth. Then backfill the space below grade with No. 67 (TDOT) crushed stone or other approved material, tamp to the proper grade, and make ready for construction. For monolithic concrete sewers or culverts and for structures, excavate rock to the outside bottom of the structure or sewer.

3.4 DISPOSAL OF MATERIALS

- A. Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the Drawings or directed by the CM shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of at the Subcontractor's expense.
- B. Waste materials may be deposited in spoil areas at locations approved by the CM. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as directed by the CM.
- C. Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat and workmanlike condition, as described below.

3.5 EXCAVATION FOR TRENCHES, MANHOLES, AND STRUCTURES

- A. Excavation for pipelines shall consist of the excavation necessary for the construction of water, sewer, storm drainage and other pipes and their appurtenances (including manholes, inlets, outlets, headwalls, collars, concrete saddles, and pipe protection) that are called for by the Drawings. It shall include clearing and grubbing where necessary, backfilling and tamping pipe trenches and around structures, and disposing of waste materials, all of which shall conform to the applicable provisions set forth elsewhere in these specifications.
- B. The Subcontractor may use a motor powered trenching machine. However, if this machine is used, the Subcontractor shall be fully responsible for the preservation or repair of existing utilities.

- C. Unless the construction of lines by tunneling, jacking, or boring is called for by the Drawings or specifically authorized by the CM, make excavation for pipelines in open cut and true to the lines and grades shown on the Drawings or established by the CM on the ground. Cut the banks of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed, but shall not be more than the distance determined by the following formula: $4/3d + 15$ inches, where "d" represents the internal diameter of the pipe in inches. When approved in writing by the CM, the banks of trenches from the ground surface down to a depth not closer than one foot above the top of the pipe may be excavated to nonvertical and nonparallel planes, provided the excavation below that depth is made with vertical and parallel sides equidistant from the pipe centerline in accordance with the formula given above. Any cut made in excess of the formula $4/3d + 15$ inches shall be at the expense of the Subcontractor and may be cause for the CM to require that stronger pipe and/or a higher class of bedding be used at no cost to the project.
- D. For rigid pipe, excavate 6 inches below the bottom of the pipe and refill trench to the bottom of the pipe elevation with Class 1-4 material (see Drawing details). For PVC and HDPE lines, provide a minimum of six inches of No. 67 (TDOT) crushed stone for bedding as called for on the Drawings.
- E. Excavation for manholes, inlets, and other incidental structures shall not be greater in horizontal area than that required to allow a two foot clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. The bottom of the excavation shall be true to the required shape and elevation shown on the Drawings. No earth backfilling will be permitted under manholes, inlets, headwalls, or similar structures. Should the Contractor excavate below the elevations shown or specified, she shall, at her own expense, fill the void with either concrete or granular material approved by the CM.
- F. Do not excavate pipe trenches more than 200 feet ahead of the pipe laying, and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where the CM deems necessary to maintain vehicular or pedestrian traffic.
- G. In all cases where materials are deposited along open trenches, place them so that in the event of rain or surcharge loading from such deposits no damage will result to the work and/or to adjacent property.
- H. Excavation for manholes and other structures may be performed with nonvertical banks except beneath pavements or adjoining existing improvements. Do not permit the horizontal area of the excavation to exceed that required to allow a two-foot clearance between the outer surface of the structure and the banks of the excavation or the sheeting used to protect the embankments. The bottom of the excavation shall be true to the required shape and elevation shown on the Drawings.

3.6 SHEETING, SHORING, AND BRACING

- A. Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to withstand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage. Separate payment will not be made for sheeting, shoring, and bracing, which are considered an incidental part of the excavation work.
- B. Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than four feet high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than four feet deep when examination of the ground indicates hazardous ground movement may be expected. Guard the

walls and faces of all excavations in which employees are exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.

- C. Comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done. The sheeting, shoring, and bracing system shall be designed by a professional engineer licensed in the State of Tennessee and shall be subject to approval by the CM. However, such approval does not relieve the Subcontractor of the sole responsibility for the safety of all employees, the effectiveness of the system, and any damages or injuries resulting from the lack or inadequacy of sheeting, shoring, and bracing.
- D. Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the Drawings, ordered by the CM, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and that cave-ins and slides are avoided.
- E. Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.
- F. The Subcontractor may use a trench box. A trench box is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. Any trench box used by the Subcontractor must meet the requirements of 29 CFR 1926.650.

3.7 THE DEWATERING OF EXCAVATION

- A. Provide and keep in operation enough suitable pumping equipment whenever necessary or whenever directed to do so by the CM. Give special attention to excavations for those structures that, prior to proper backfilling, are subject to flotation from hydrostatic uplift.

3.8 BORROW EXCAVATION

- A. Whenever the backfill of excavated areas or the placement of embankments requires more material than is available from authorized excavations, or whenever the backfill material from such excavations is unsuitable, then obtain additional material from other sources. This may require the opening of borrow pits at points accessible to the work. Before a borrow pit is opened, the quality and suitability of its material shall be approved by the CM. All state and local regulation concerning borrow pits, drainage and erosion control shall be strictly followed. The CM will provide the Subcontractor with a location for suitable borrow material.
- B. Excavate borrow pits in such a way that the remaining surfaces and slopes are reasonably smooth and that adequate drainage is provided over the entire area. Construct drainage ditches wherever necessary to provide outlets for water to the nearest natural channel, thus preventing the formation of pools in the pit area. Leave the sides of borrow pit cuts at a maximum slope of 2:1 unless otherwise directed by the CM. Comply with all the requirements of the ORNL Stormwater and Pollution Prevention Plan.
- C. Properly clear and grub borrow pits, and remove all objectionable matter from the borrow pit material before placing it in the backfill.
- D. The taking of materials from borrow pits for use in the construction of backfill, fills, or embankments shall be considered an incidental part of the work; no separate payment shall be made for this activity.

3.9 BACKFILLING

- A. Begin backfilling after the line construction is completed and then inspected and approved by the CM. Backfilling will be as directed by the Drawings. Place this backfill simultaneously on either side of the pipe in even layers that before compaction are no more than six inches deep. Thoroughly and completely tamp each layer into place before placing additional layers. When shown on the Drawings, this backfill shall, at locations beneath or closely adjacent to pavement, consist of No. 57 (TDOT) crushed stone.
- B. If PVC sewer or HDPE natural gas pipe is used, install No. 67 (TDOT) crushed stone in a six-inch envelope on all sides of the pipe. Then add the remaining backfill up to one foot above the top of the pipe as described in the previous paragraph.
- C. From one foot above the pipe upward, the backfill material may contain broken stones that make up approximately 3/4 of the backfill's total volume. However, if this type of backfill is used, there must be enough spalls and earth materials to fill all voids completely. The maximum dimension of individual stones in such backfill shall not exceed six inches, and the backfill material shall be placed and spread in even layers not more than eight inches deep. At locations beneath or closely adjacent to pavement or at locations of improvements subject to damage by displacement, tamp and thoroughly compact the backfill in layers that, before compaction, are six inches deep. In other areas, the backfill for the upper portion of the trenches may be placed without tamping but shall be compacted to a density equivalent to that of adjacent earth material as determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.
- D. If earth material for backfill is, in the opinion of the CM, too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth material that the CM considers too wet or otherwise unsuitable.
- E. Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified above for pipelines except that even greater care is necessary to prevent damage to the utility structure.
- F. Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make whatever repairs are necessary, whenever directed to do so by the CM.
- G. Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the CM's requiring that the Subcontractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.
- H. Compaction Requirements: Compact to 95 percent maximum density in accordance with ASTM D698.

3.10 MAINTENANCE

- A. Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the CM.
- B. Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the CM. Continue such maintenance until final acceptance of the project, or until the CM issues a written release.

3.11 SLOPES

- A. Neatly trim all open cut slopes, and finish to conform either with the slope lines shown on the Drawings or the directions of the CM. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Subcontractor will not be required to use hand methods if he is able to obtain the required degree of evenness with mechanical equipment. Conduct grading operations so that material is not removed or loosened beyond the required slope.

END OF SECTION 02222